



Economic Impacts of Harmful Algal Blooms (HABs)



Some harmful algae produce potent toxins which cause illness or death in humans and other organisms, including endangered species. Other harmful algae are non-toxic to humans and wildlife but degrade ecosystems by forming such large blooms that they can adversely affect corals, seagrasses, and organisms living on the sea-bottom. Human health and ecosystem impacts of HABs, and management responses to lessen those impacts, can in turn have significant economic and sociocultural consequences.

Coastal HAB events have been estimated to have economic impacts in the U.S. of at least \$82 million/year with the majority of impacts in the public health and commercial fisheries sectors (Hoagland and Scatasta 2006). This estimate is conservative due in part to a lack of information about individual events, unquantified economic effects of environmental impacts, and a lack of documentation of sociocultural impacts (such as loss of cultural practices and values, increased reliance on social services, decreased recreational opportunities, and shifts in livelihoods). Moreover, unreported illnesses, reductions in property values, lost seafood sales due to unfounded consumer fears (the “halo effect”), and lost revenue from some untapped fisheries are just a few examples of economic effects not accounted for in this estimate. The magnitude of estimated economic impacts from individual events (see U.S. map on next page) can exceed this annual average, further highlighting how this estimate may be too conservative.

Economic Effects of HABs in the U.S. are at least \$82 million/year*

Commercial Fisheries Impacts: \$38 million/year

Public Health Costs of Illness: \$37 million/year

Recreation and Tourism Impacts: \$4 million/year

Coastal Monitoring and Management: \$3 million/year

*Hoagland and Scatasta (2006). Based on subset of outbreaks in 1987-2000.



The HARRNESS and HARR-HD reports identified a need for economic assessments of HAB impacts at local and regional scales and for assessing economic costs and benefits of management strategies.

<http://www.whoi.edu/redtide/nationplan/2005nationalplan.html>
<http://coastalscience.noaa.gov/stressors/extremeevents/hab/HDstrategy.pdf>

What is NOAA doing?

- NOAA, through extramural funding (ECO HAB, MERHAB, and CSCOR Event Response) and intramural research programs, is working to minimize public health, sociocultural, and economic impacts by improving prediction and monitoring, developing methods of control, and improving public understanding.
- NOAA is also funding research to assess economic impacts at local scales and to assess the costs and benefits of mitigation strategies, which were both identified by HARRNESS and HARR-HD as research needs to improve focus and cost-effectiveness of mitigation strategies.

Economic Impacts of Recent HAB Events

Impacts on commercial, subsistence, and recreational fisheries in the Pacific Northwest: \$10-12 million in 2002/03

In 2002-03, high levels of domoic acid in razor clams along the Pacific Coast resulted in a season long closure of the fishery in Washington to protect human consumers from Amnesic Shellfish Poisoning (ASP). In addition, high toxin levels caused the first commercial Dungeness crab fishery closure due to algal toxins since 1991. This event resulted in at least \$10-12 million in lost revenue.

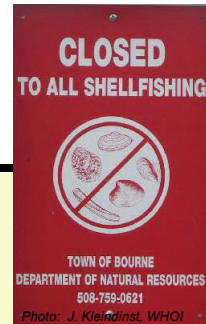


The oyster, Dungeness crab, and razor clam fisheries in Washington are cumulatively valued at \$72 million/year for the local economies and are important for commerce, recreation, and the culture of local coastal tribes.

Impacts of New England Red Tide on Commercial Fisheries: \$11 million in 2005

In 2005, an historic *Alexandrium fundyense* bloom (also called red tide) in New England resulted in extensive and, in some locations, unprecedented closures of shellfish harvesting to prevent paralytic shellfish poisoning (PSP) in human consumers.

A preliminary estimate of the economic impact due to lost shellfish sales in Massachusetts and Maine as a result of imposed closures is approximately \$11 million (NOAA Economic Statistics Report). Furthermore, offshore surfclam, ocean quahog, and roe-on sea scallop fisheries that are indefinitely closed due to shellfish toxicity likely result in millions of dollars of lost revenue.



Impacts of Macroalgae in Maui, HI: \$20 million/ year

Macroalgal blooms, which adversely impact coral reefs and local aesthetics, are a recurring problem along the Kihei coast in Maui. These blooms potentially cost Hawaii more than \$20 million in lost revenue each year, due to reductions in real estate value and hotel business as well as increased clean-up costs (NOAA Economic Statistics Report). Van Beukering and Cesar (2004) estimated that continued algal blooms could result in additional losses of \$16 million annually over the next several decades.



Karenia brevis Impacts on Tourism in Florida: possibly as high as \$240 million in 2005

An unusually large and persistent bloom in 2005 of the Florida HAB species, *Karenia brevis* (also called red tide), resulted in massive fish kills, unusual mortalities of protected species (such as manatees, dolphins, and sea turtles), reports of human respiratory irritation in residents and beach-goers, and mass mortalities of bottom-dwelling organisms (due to low oxygen) in over 2000 square miles of sea-bottom west of central Florida. The magnitude of those impacts has not yet been documented but based on theorized tourism losses, the Convention and Visitors Bureau has cited potential losses up to \$240 million in the Tampa Bay area alone.



Impacts of *Karenia brevis* in Galveston, Texas: \$10 million in 2000

In summer of 2000, a *Karenia brevis* outbreak and associated fish kills were reported in Texas coastal waters. The fish kills persisted in many areas through November. Most Texas coastal waters were closed to shellfish harvesting until the end of November to protect human consumers from Neurotoxic Shellfish Poisoning (NSP). Some areas remained closed until January 2001.

A case study of the 2000 red tide in Texas estimated that economic impacts were at least \$9.9 million in Galveston county alone due to commercial oyster fishery closures, lost tourism, and costs of beach cleanup (Evans and Jones 2001).



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